O I P E
FEB 05 2004
JC42
PATENT & TRADEMARK OFFICE

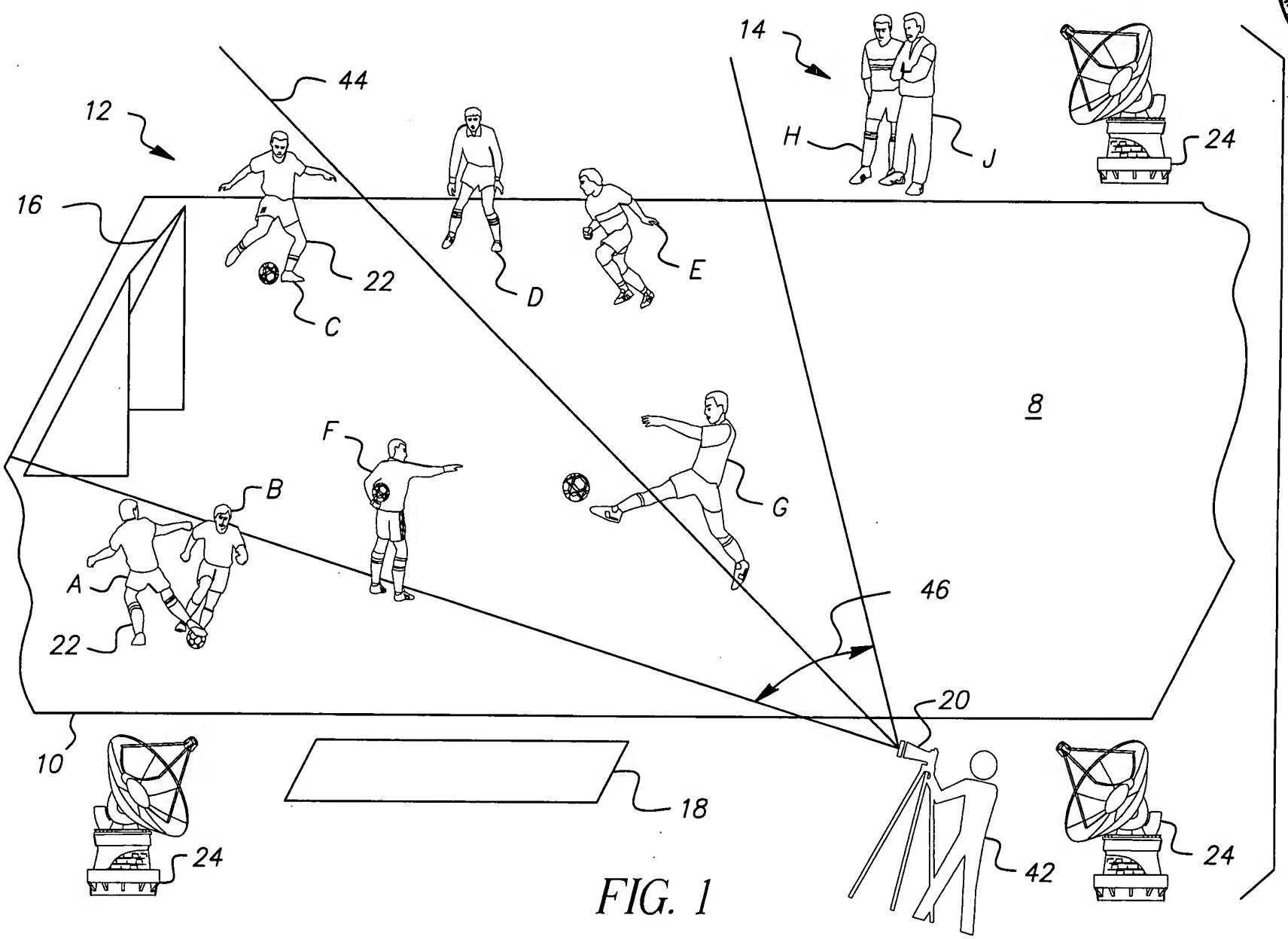



FIG. 1

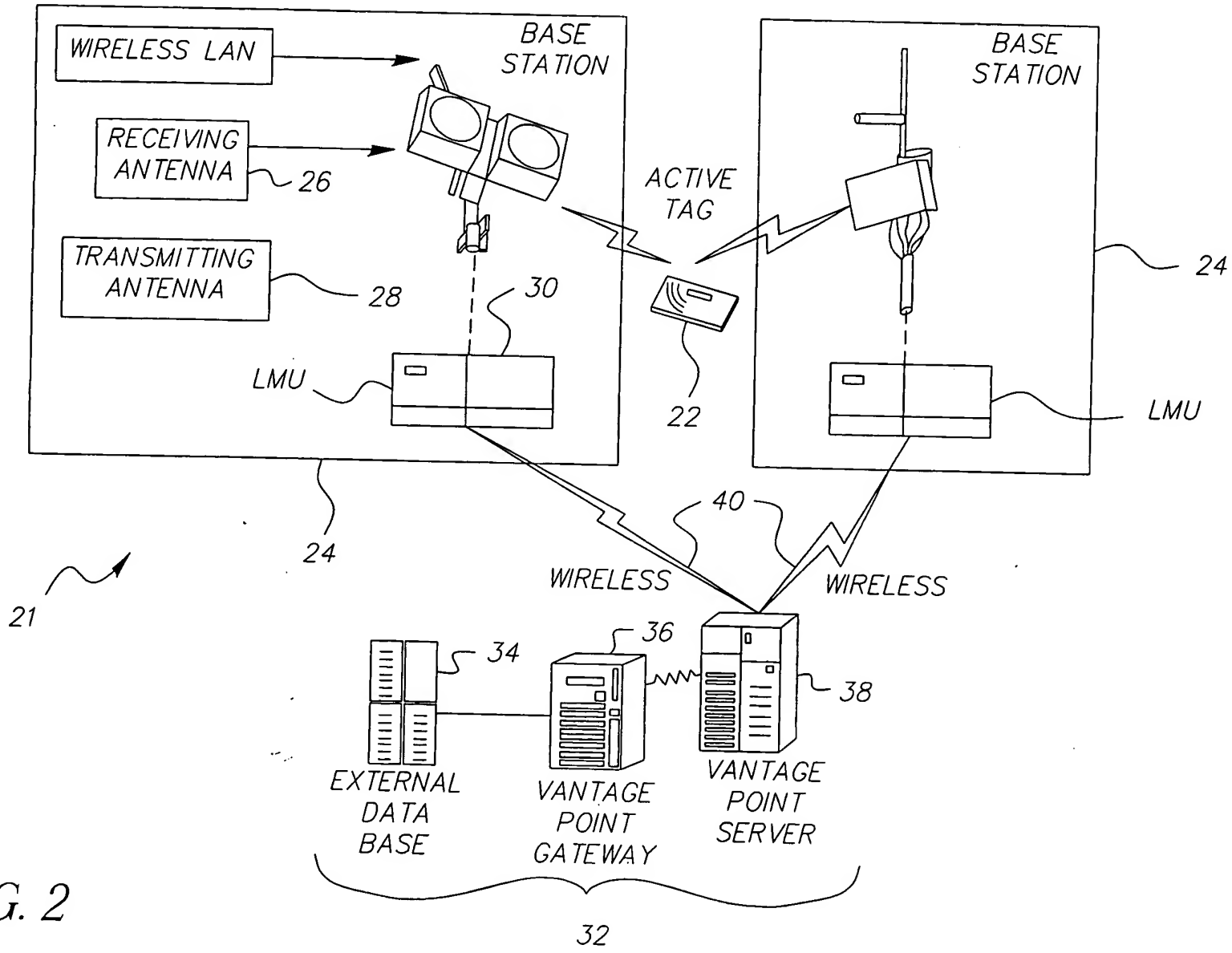

WIRELESS LAN
BASE STATION
RECEIVING ANTENNA
26
ACTIVE TAG
TRANSMITTING ANTENNA
28
30
24
LMU
22
BASE STATION
LMU
24
40
21
WIRELESS
WIRELESS
34
36
38
EXTERNAL DATA BASE
VANTAGE POINT GATEWAY
VANTAGE POINT SERVER
32

FIG. 2

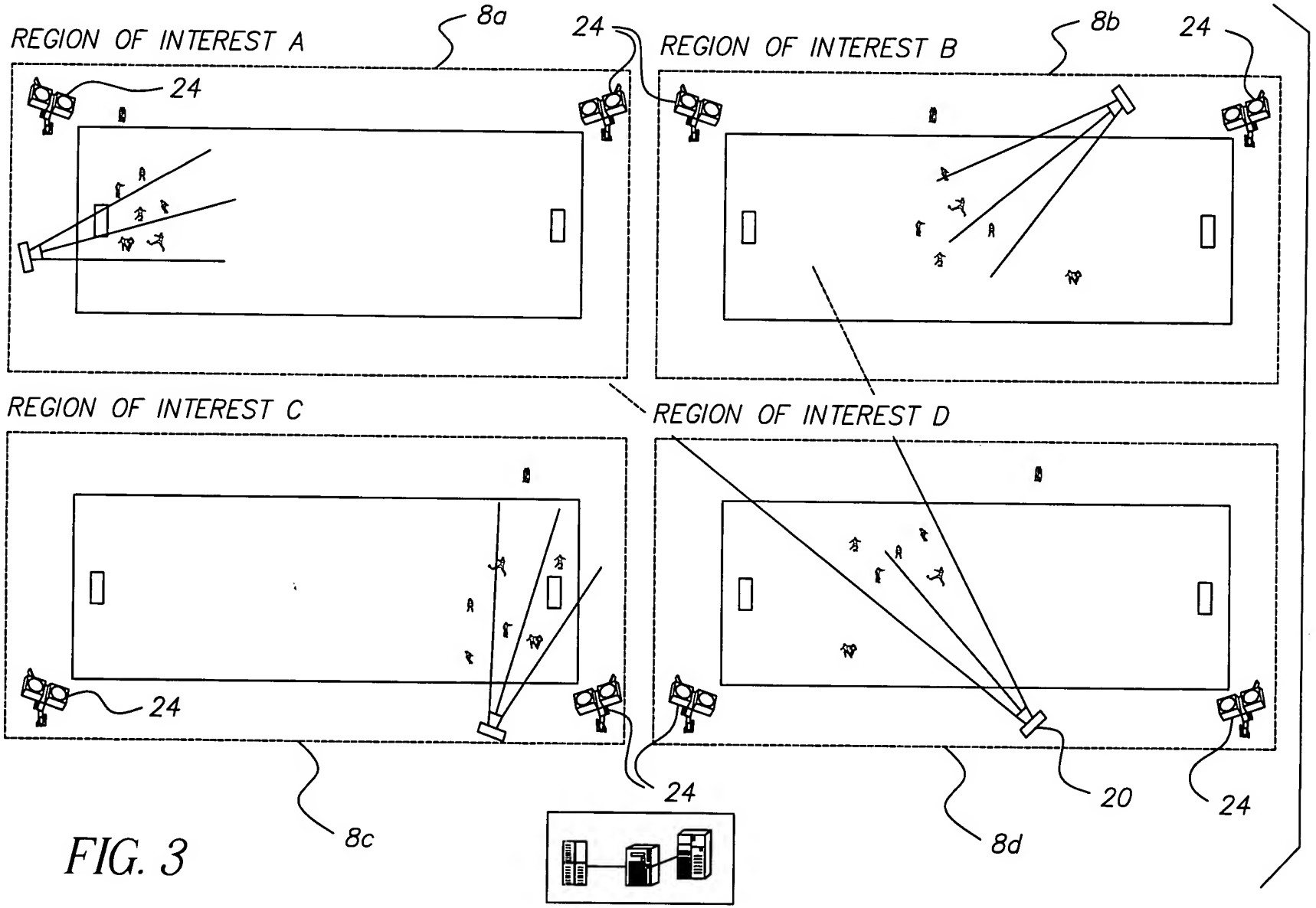

REGION OF INTEREST A
8a
24
24
REGION OF INTEREST B
8b
24
REGION OF INTEREST C
REGION OF INTEREST D
24
24
20
24
8c
8d

FIG. 3

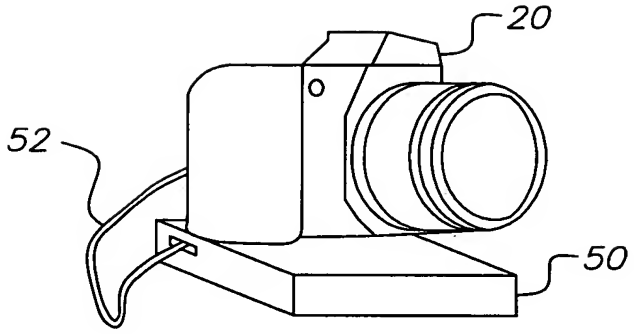



FIG. 4A

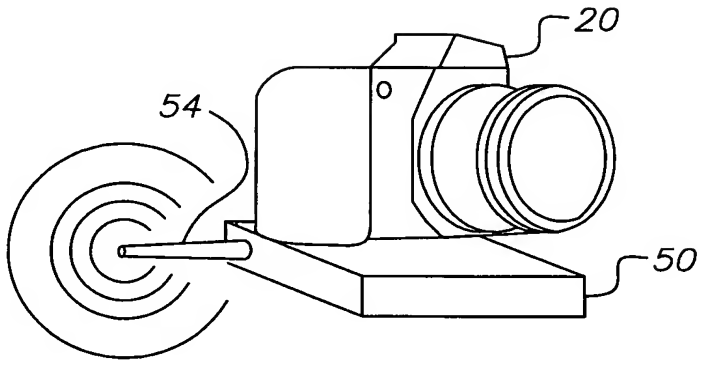



FIG. 4B

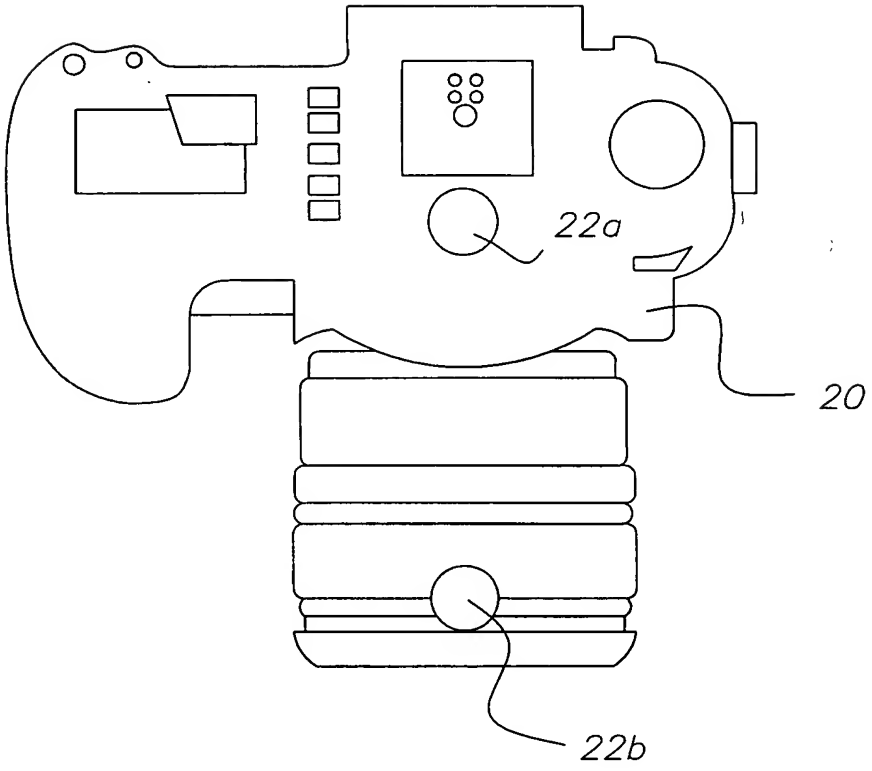



FIG. 5A

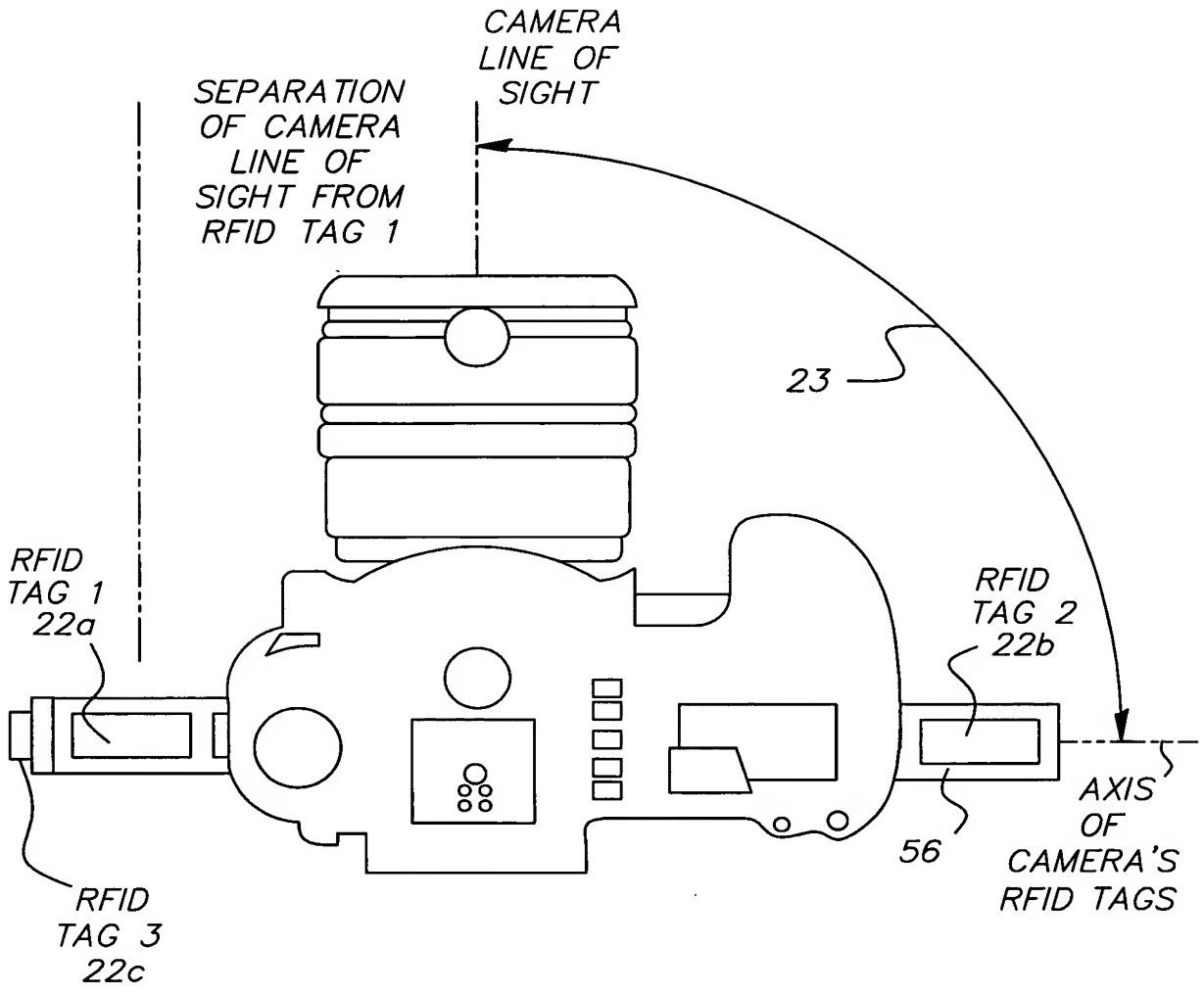

CAMERA
LINE OF
SIGHT
SEPARATION
OF CAMERA
LINE OF
SIGHT FROM
RFID TAG 1
23
RFID
TAG 1
22a
RFID
TAG 2
22b
AXIS
OF
CAMERA'S
RFID TAGS
56
RFID
TAG 3
22c

FIG. 5B

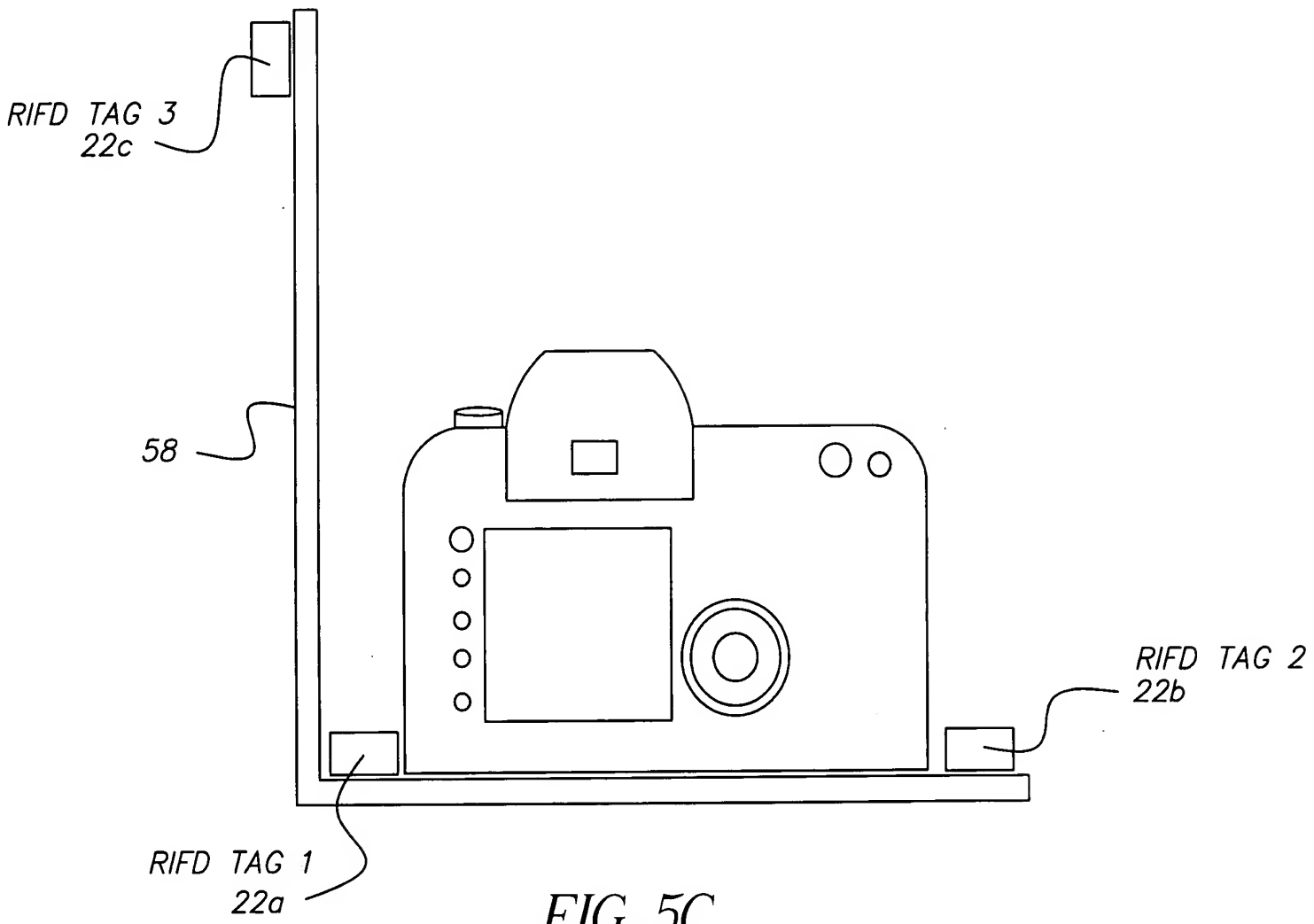



FIG. 5C

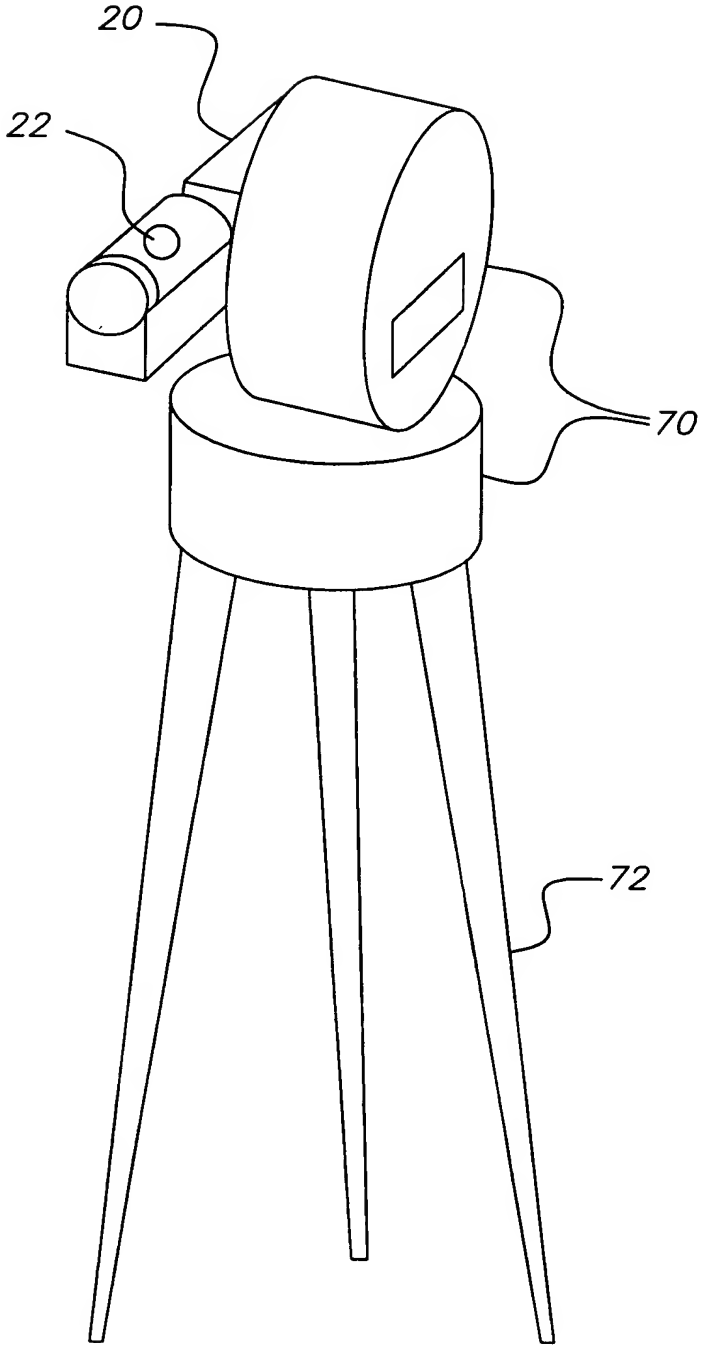



*FIG. 6*

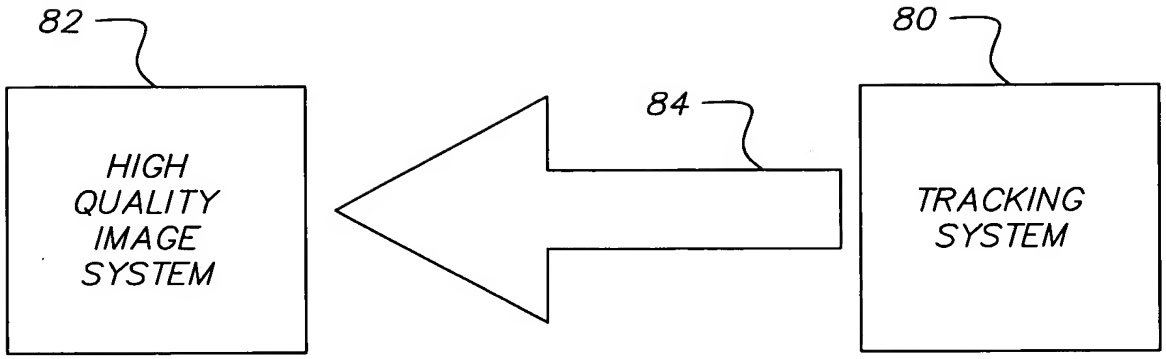

82
80
84
HIGH QUALITY IMAGE SYSTEM
TRACKING SYSTEM

FIG. 7A

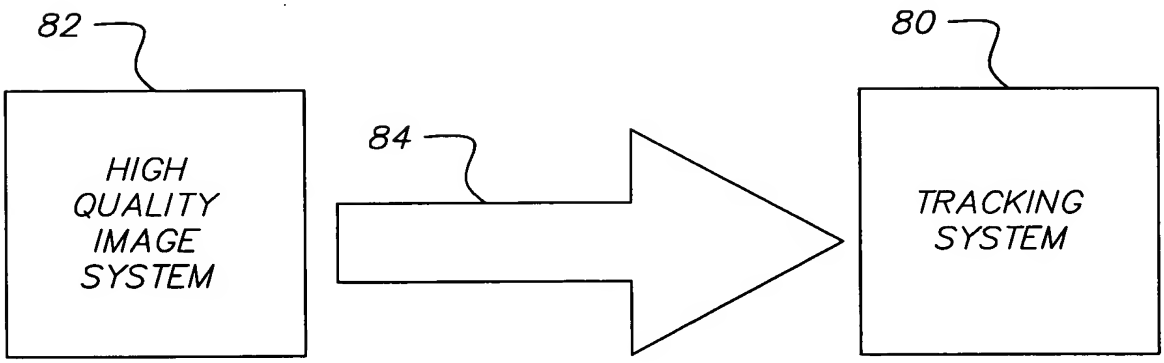

82
80
84
HIGH QUALITY IMAGE SYSTEM
TRACKING SYSTEM

FIG. 7B

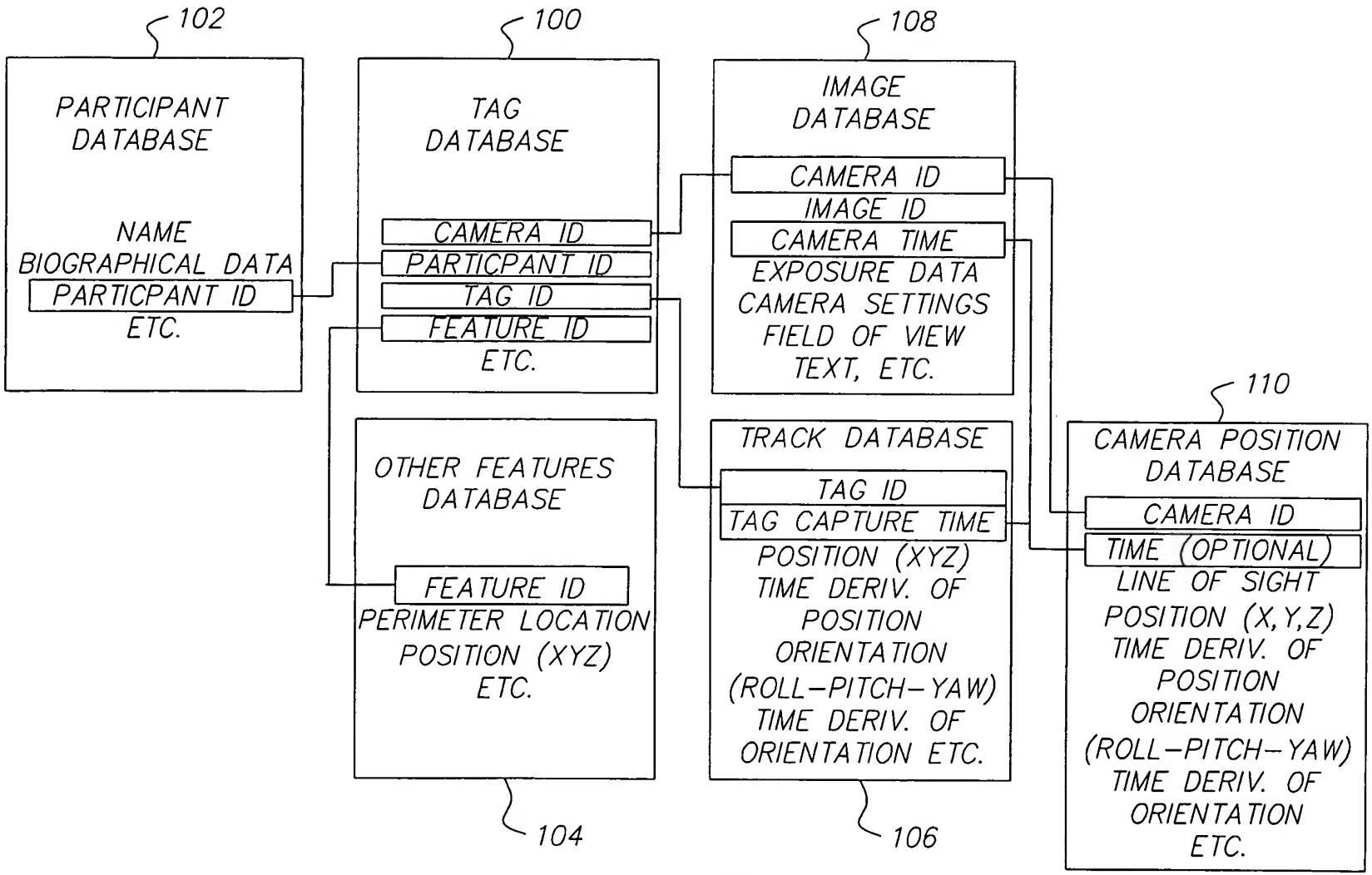

102
PARTICIPANT DATABASE
NAME
BIOGRAPHICAL DATA
PARTICPANT ID
ETC.
100
TAG DATABASE
CAMERA ID
PARTICPANT ID
TAG ID
FEATURE ID
ETC.
108
IMAGE DATABASE
CAMERA ID
IMAGE ID
CAMERA TIME
EXPOSURE DATA
CAMERA SETTINGS
FIELD OF VIEW
TEXT, ETC.
110
CAMERA POSITION DATABASE
CAMERA ID
TIME (OPTIONAL)
LINE OF SIGHT
POSITION (X,Y,Z)
TIME DERIV. OF POSITION
ORIENTATION
(ROLL-PITCH-YAW)
TIME DERIV. OF ORIENTATION
ETC.
OTHER FEATURES DATABASE
FEATURE ID
PERIMETER LOCATION
POSITION (XYZ)
ETC.
104
TRACK DATABASE
TAG ID
TAG CAPTURE TIME
POSITION (XYZ)
TIME DERIV. OF POSITION
ORIENTATION
(ROLL-PITCH-YAW)
TIME DERIV. OF ORIENTATION ETC.
106

FIG. 8

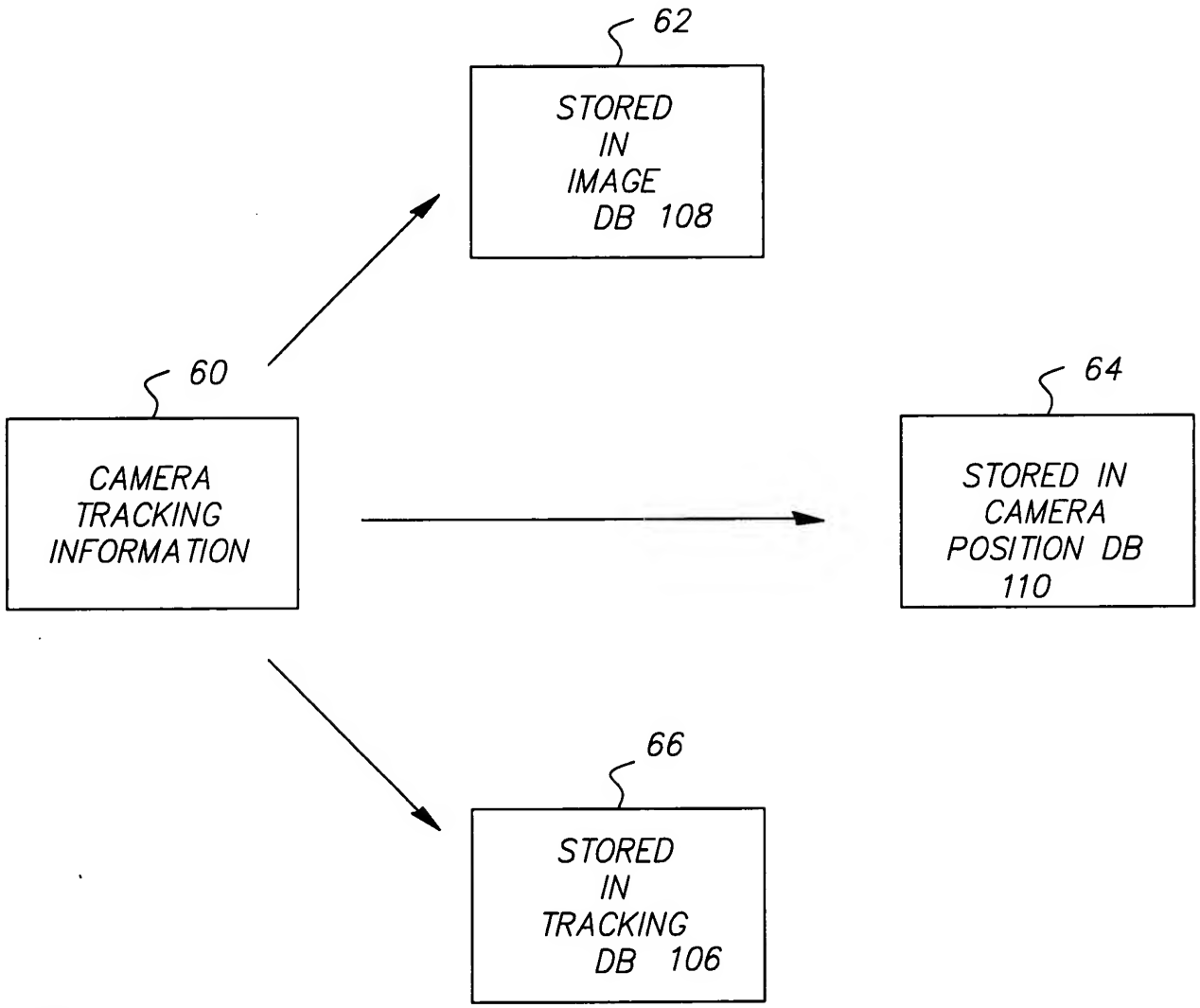

62
STORED IN IMAGE DB 108
60
CAMERA TRACKING INFORMATION
64
STORED IN CAMERA POSITION DB 110
66
STORED IN TRACKING DB 106

FIG. 9

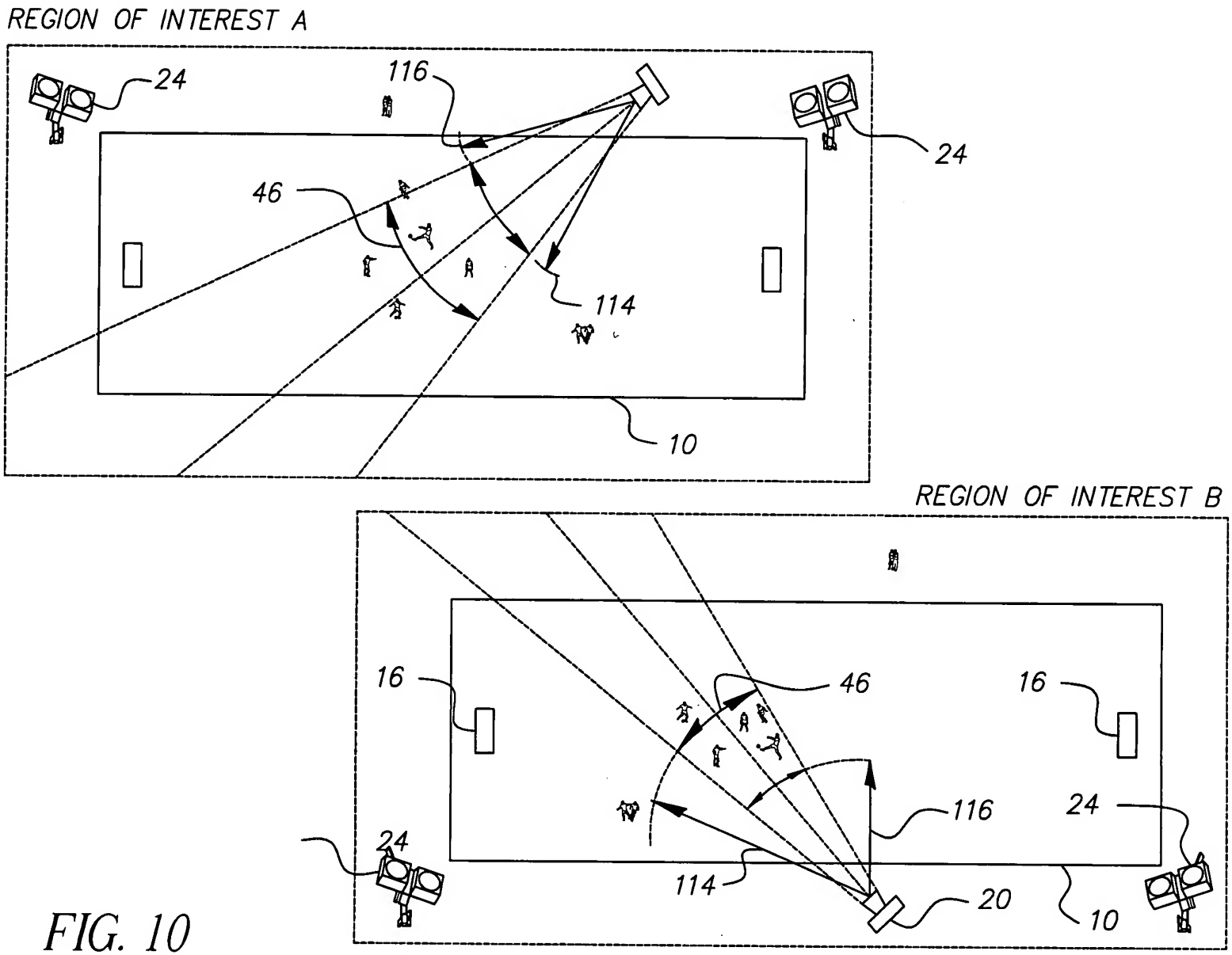

REGION OF INTEREST A
24
116
24
46
114
10
REGION OF INTEREST B
16
46
16
116
24
24
114
20
10

FIG. 10

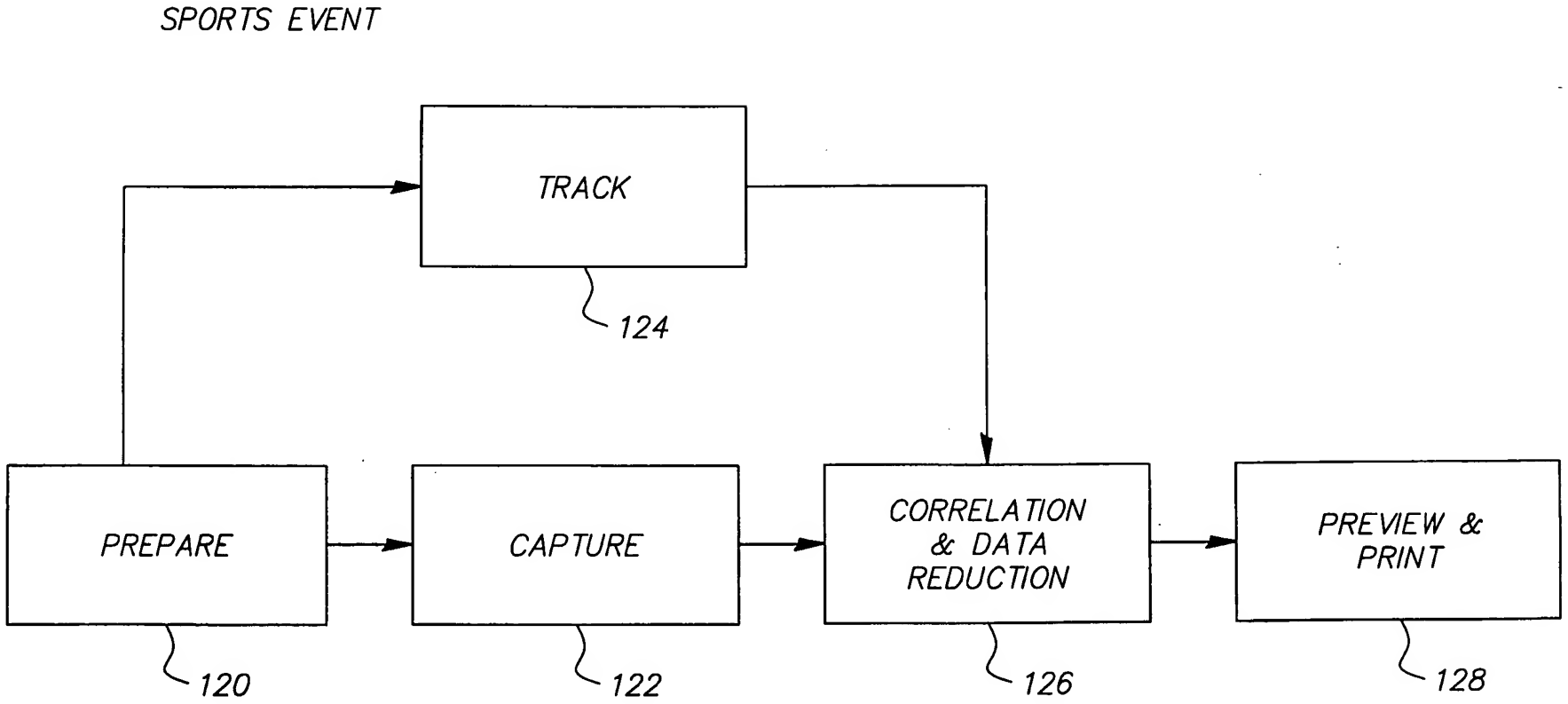

SPORTS EVENT
TRACK
124
PREPARE
CAPTURE
CORRELATION & DATA REDUCTION
PREVIEW & PRINT
120
122
126
128

FIG. 11

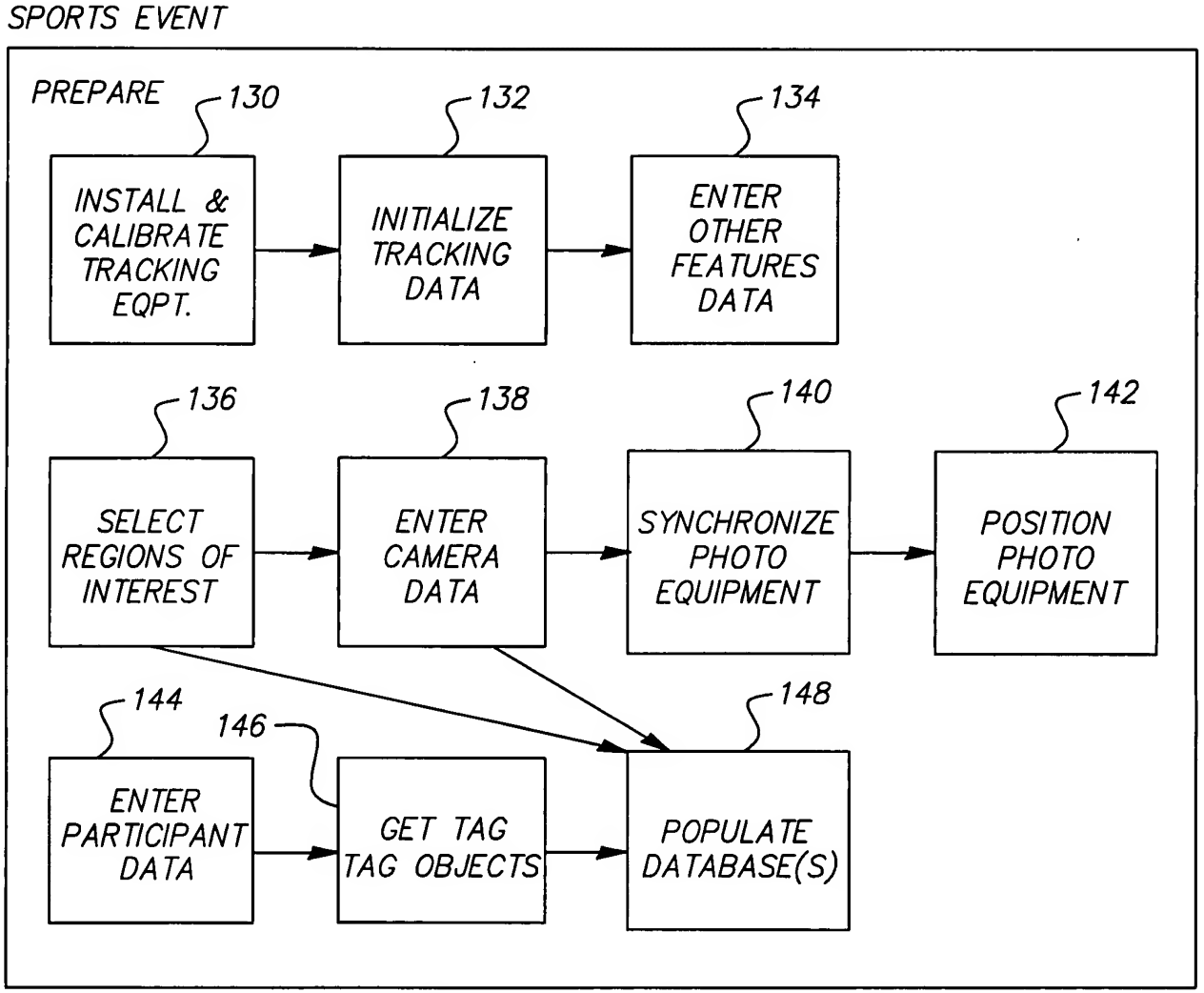

SPORTS EVENT
PREPARE
130
INSTALL & CALIBRATE TRACKING EQPT.
132
INITIALIZE TRACKING DATA
134
ENTER OTHER FEATURES DATA
136
SELECT REGIONS OF INTEREST
138
ENTER CAMERA DATA
140
SYNCHRONIZE PHOTO EQUIPMENT
142
POSITION PHOTO EQUIPMENT
144
ENTER PARTICIPANT DATA
146
GET TAG TAG OBJECTS
148
POPULATE DATABASE(S)

FIG. 12

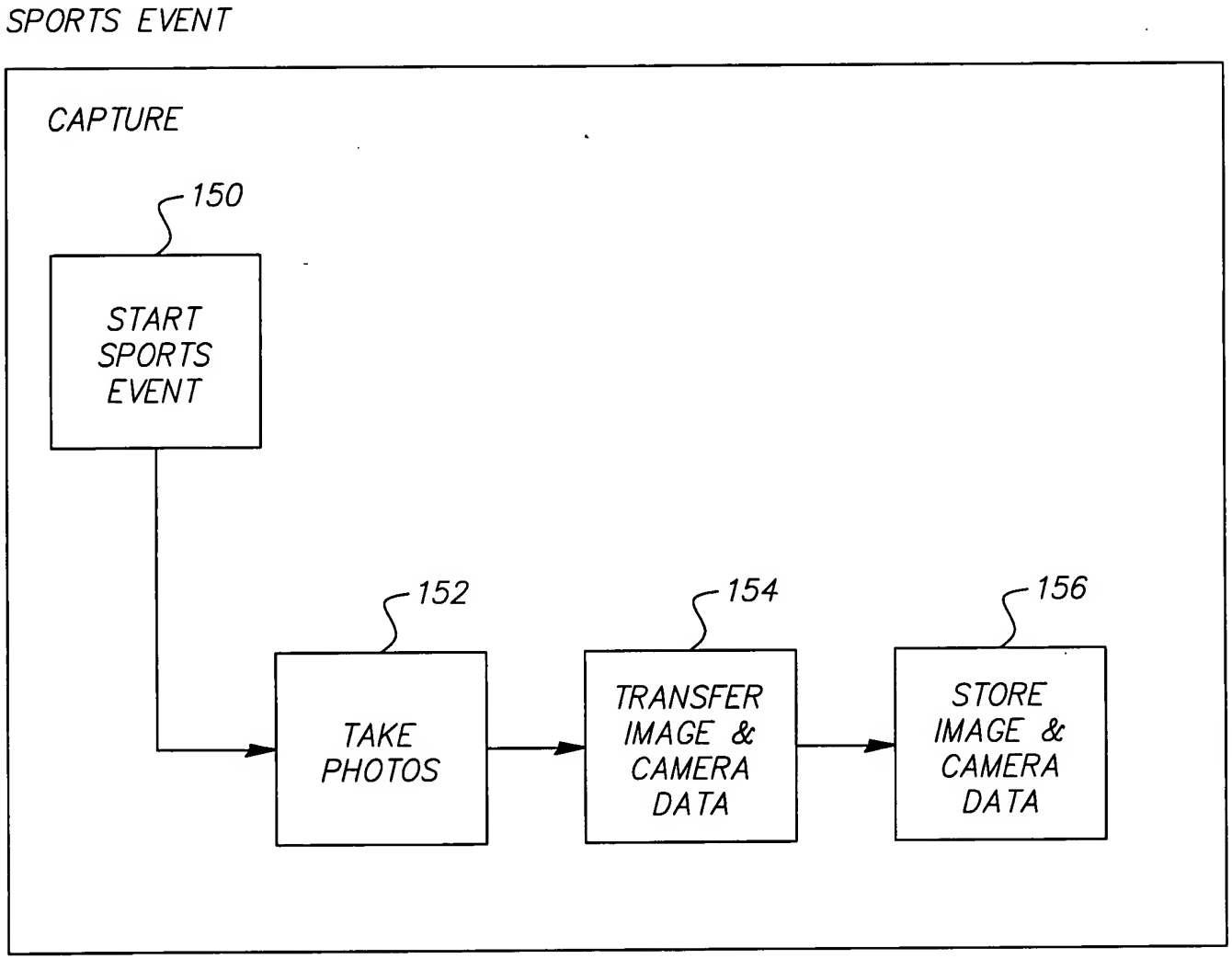

SPORTS EVENT
CAPTURE
150
START SPORTS EVENT
152
TAKE PHOTOS
154
TRANSFER IMAGE & CAMERA DATA
156
STORE IMAGE & CAMERA DATA

FIG. 13

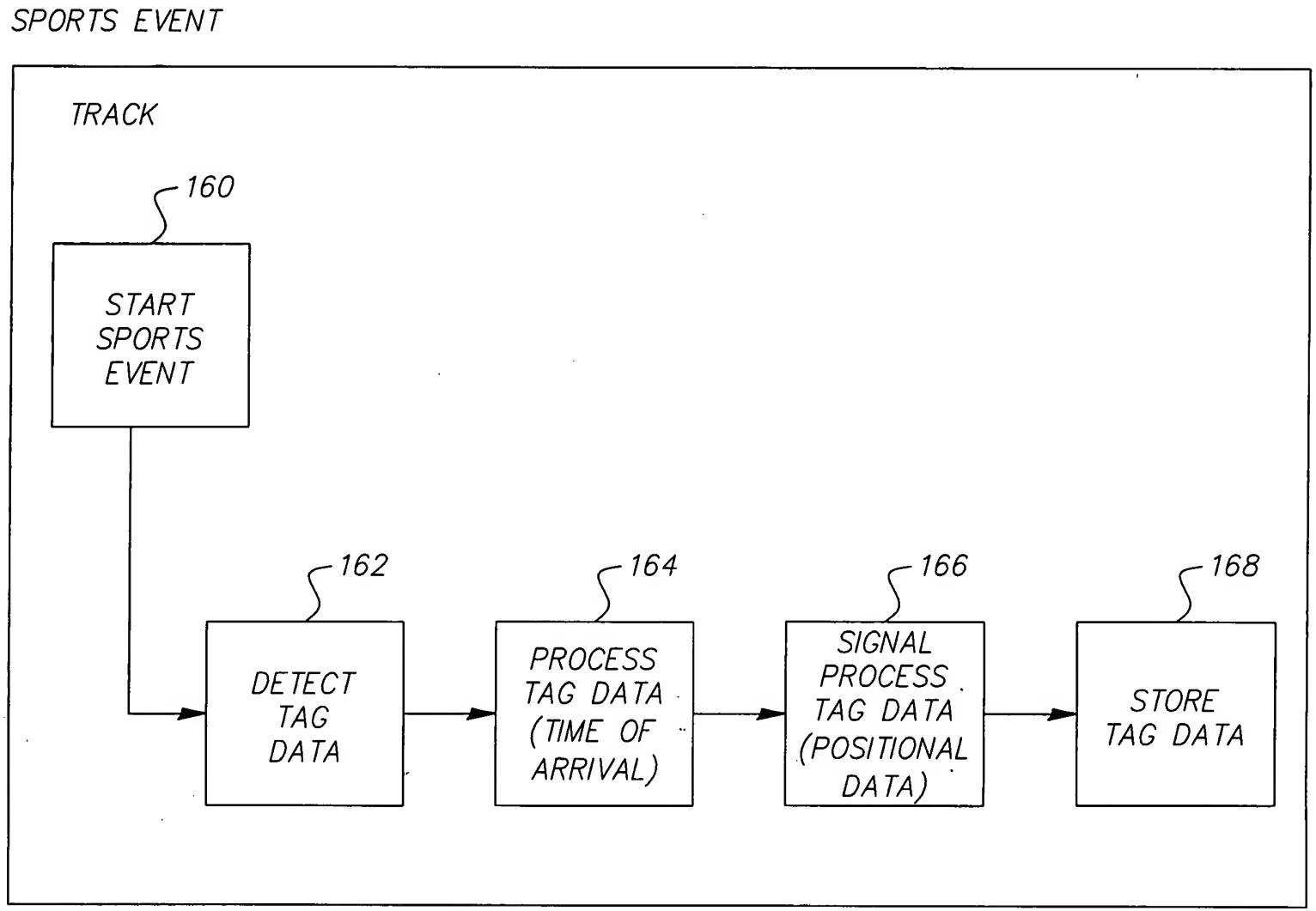

SPORTS EVENT
TRACK
160
START SPORTS EVENT
162
DETECT TAG DATA
164
PROCESS TAG DATA (TIME OF ARRIVAL)
166
SIGNAL PROCESS TAG DATA (POSITIONAL DATA)
168
STORE TAG DATA

FIG. 14

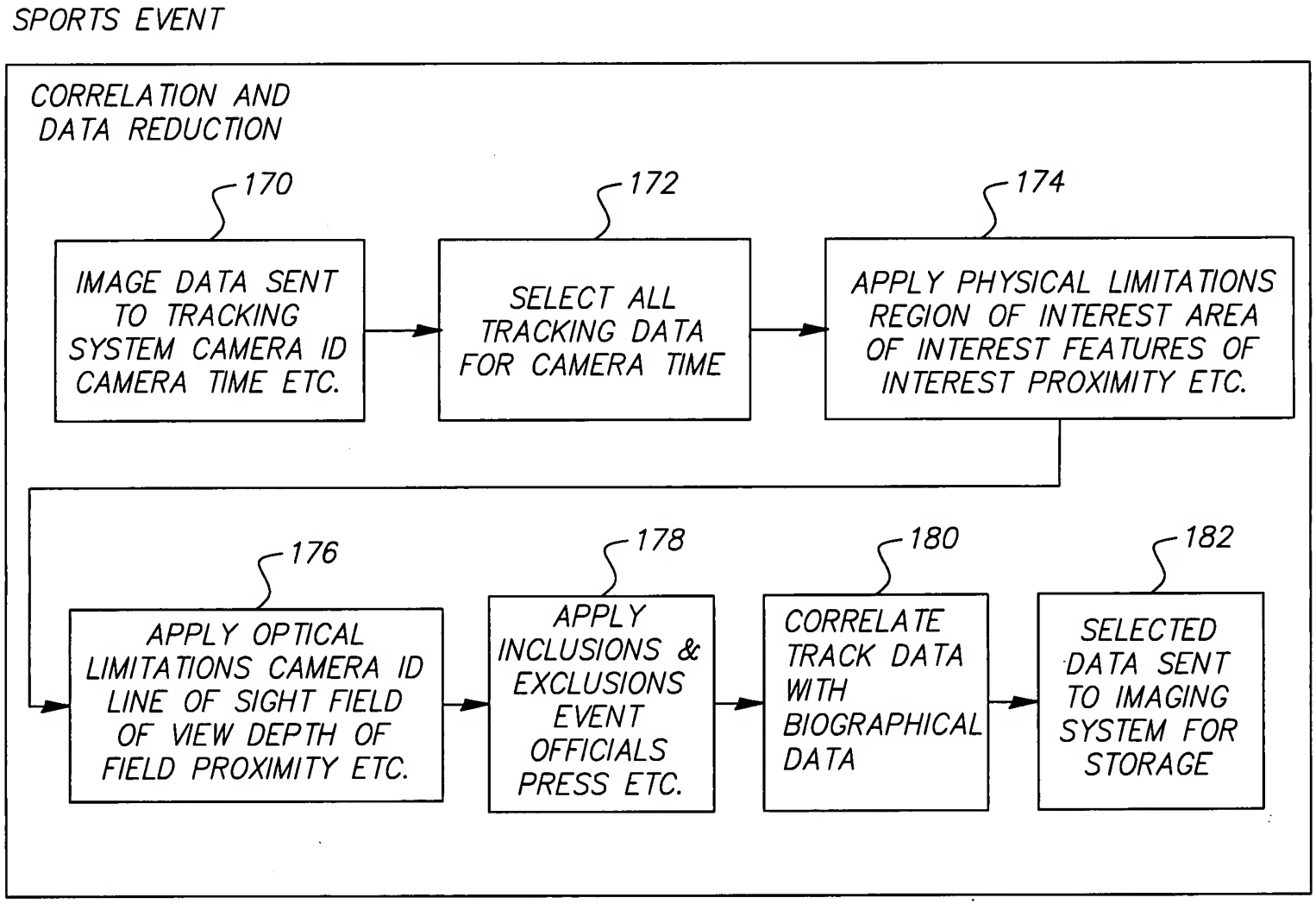
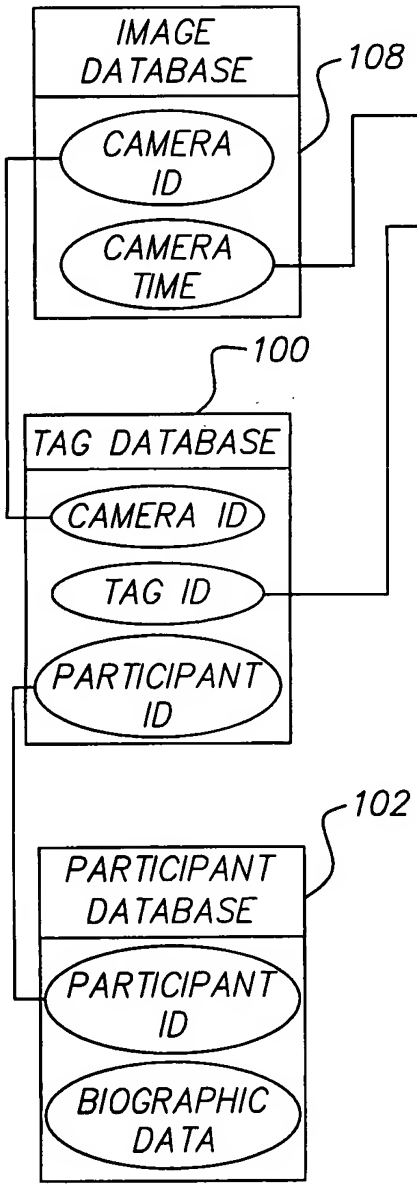

SPORTS EVENT
CORRELATION AND DATA REDUCTION
170
IMAGE DATA SENT TO TRACKING SYSTEM CAMERA ID CAMERA TIME ETC.
172
SELECT ALL TRACKING DATA FOR CAMERA TIME
174
APPLY PHYSICAL LIMITATIONS REGION OF INTEREST AREA OF INTEREST FEATURES OF INTEREST PROXIMITY ETC.
176
APPLY OPTICAL LIMITATIONS CAMERA ID LINE OF SIGHT FIELD OF VIEW DEPTH OF FIELD PROXIMITY ETC.
178
APPLY INCLUSIONS & EXCLUSIONS EVENT OFFICIALS PRESS ETC.
180
CORRELATE TRACK DATA WITH BIOGRAPHICAL DATA
182
SELECTED DATA SENT TO IMAGING SYSTEM FOR STORAGE

FIG. 15




TRACK DATABASE

| TAG ID | TRACK TIME | XYZ LOCATION | ROLL PITCH YAW | CAMERA TIME | GAME TIME |
|---|---|---|---|---|---|
| Aa123465 | 10:42:14:01 | X1, Y1, Z1 | R1, P1, W1 | 10:42:14:32 | 0:21:14:41 |
| Aa14562 | 10:42:14:01 | X2, Y2, Z2 | R2, P2, W2 | 10:42:14:33 | 0:21:14:44 |
| Aa123465 | 10:42:14:37 | X3, Y3, Z3 | R3, P3, W3 | 10:42:15:40 | 0:21:15:57 |
| EP213LMX | 10:42:14:39 | X4, Y4, Z4 | R4, P4, W4 | 10:42:15:48 | 0:21:16:05 |
| 123UW213Q | 10:42:14:41 | X5, Y5, Z5 | R5, P5, W5 | 10:42:16:00 | 0:21:16:18 |
| Aa123465 | 10:42:15:03 | X6, Y6, Z6 | R6, P6, W6 | 10:42:16:54 | 0:21:17:13 |
| EP213LMX | 10:42:15:08 | X7, Y7, Z7 | R7, P7, W7 | 10:42:17:01 | 0:21:17:28 |

106

FIG. 16

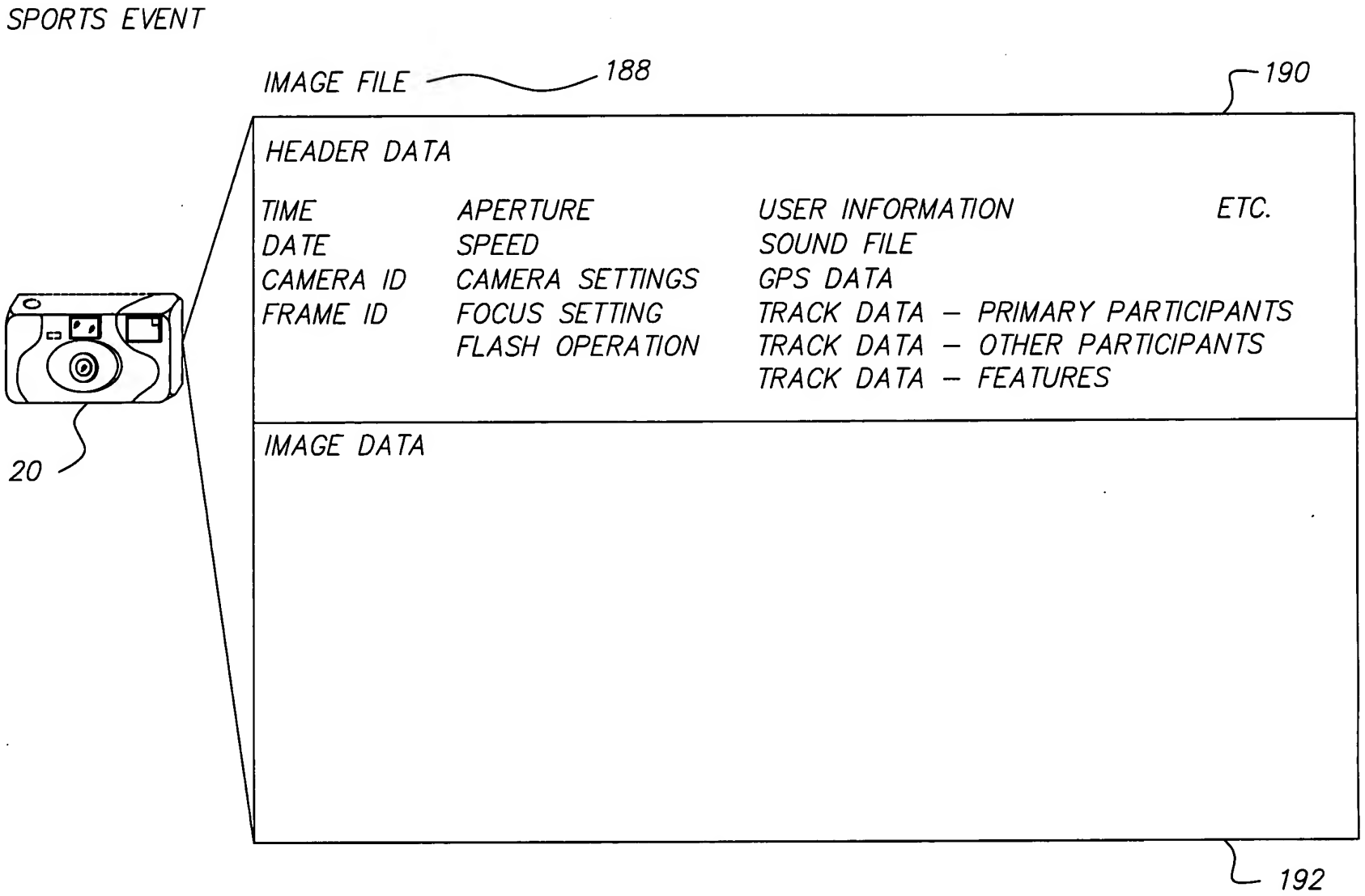

SPORTS EVENT
IMAGE FILE
188
190
HEADER DATA
TIME
DATE
CAMERA ID
FRAME ID
APERTURE
SPEED
CAMERA SETTINGS
FOCUS SETTING
FLASH OPERATION
USER INFORMATION
SOUND FILE
GPS DATA
TRACK DATA – PRIMARY PARTICIPANTS
TRACK DATA – OTHER PARTICIPANTS
TRACK DATA – FEATURES
ETC.
IMAGE DATA
20
192

FIG. 17

SPORTS EVENT

| IDENTIFICATION INFORMATION | | | | CAMERA ID = 26<br>FRAME ID = 121 | |
|---|---|---|---|---|---|
| TAG ID | PARTICIPANT | XYZ LOCATION | IN DoF | IN FOV | PERSON OR OBJECT |
| Aa123465 | JOE | X1, Y1, Z1 | YES | YES | P |
| Aa14567 | TOM | X2, Y2, Z2 | NO | YES | P |
| Aa123492 | HAROLD | X3, Y3, Z3 | YES | YES | P |
| EP213LMX | EAST GOAL | X4, Y4, Z4 | NO | YES | Q |
| 123UW213Q | STEPHANIE | X5, Y5, Z5 | NO | YES | P |
| Aa123639 | MICHAEL | X6, Y6, Z6 | YES | YES | P |
| EP213LPT | REFEREE #3 | X7, Y7, Z7 | NO | YES | P |

FIG. 18

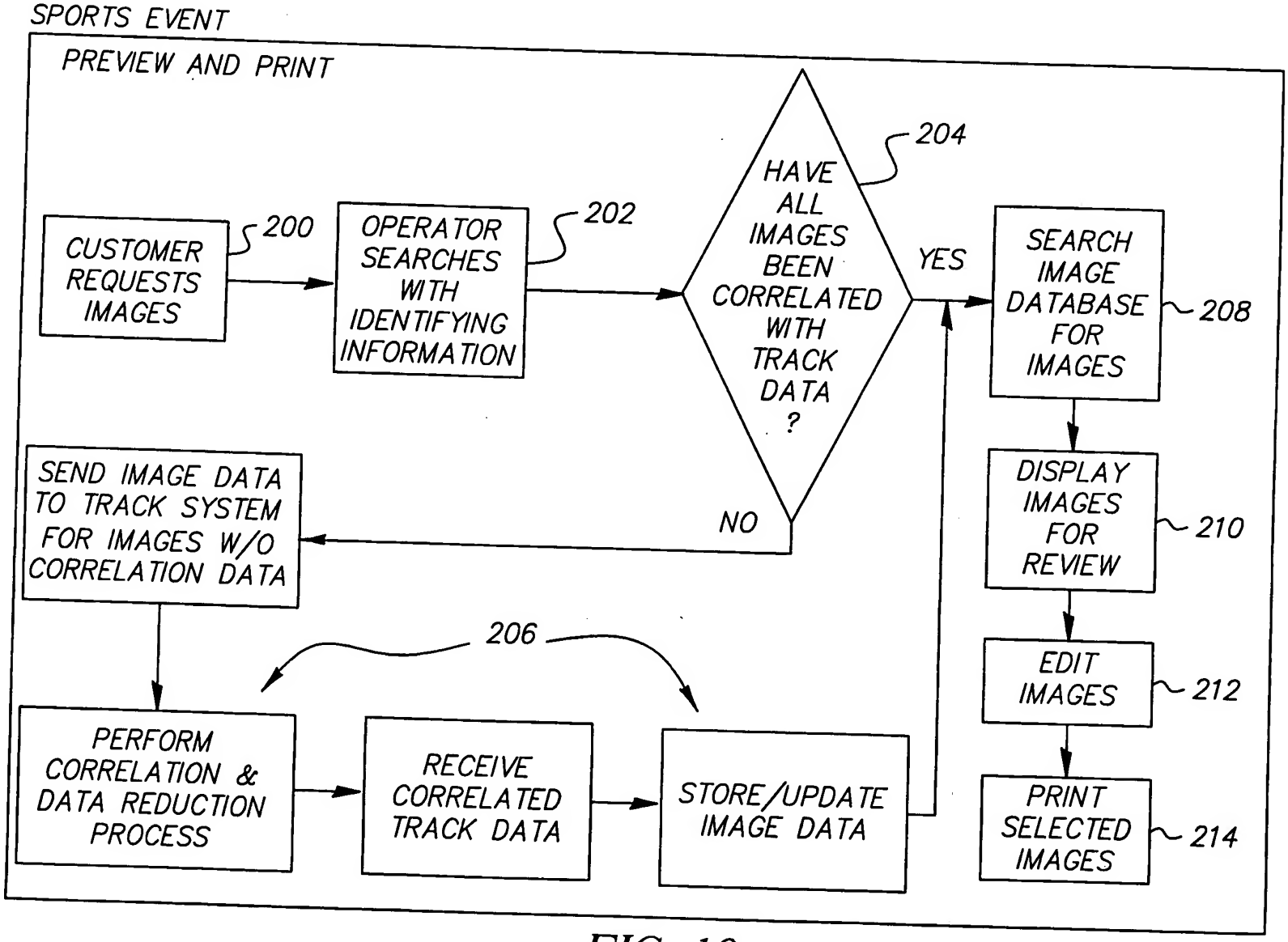

SPORTS EVENT
PREVIEW AND PRINT
CUSTOMER REQUESTS IMAGES
200
OPERATOR SEARCHES WITH IDENTIFYING INFORMATION
202
HAVE ALL IMAGES BEEN CORRELATED WITH TRACK DATA ?
204
YES
NO
SEARCH IMAGE DATABASE FOR IMAGES
208
DISPLAY IMAGES FOR REVIEW
210
EDIT IMAGES
212
PRINT SELECTED IMAGES
214
SEND IMAGE DATA TO TRACK SYSTEM FOR IMAGES W/O CORRELATION DATA
206
PERFORM CORRELATION & DATA REDUCTION PROCESS
RECEIVE CORRELATED TRACK DATA
STORE/UPDATE IMAGE DATA

FIG. 19

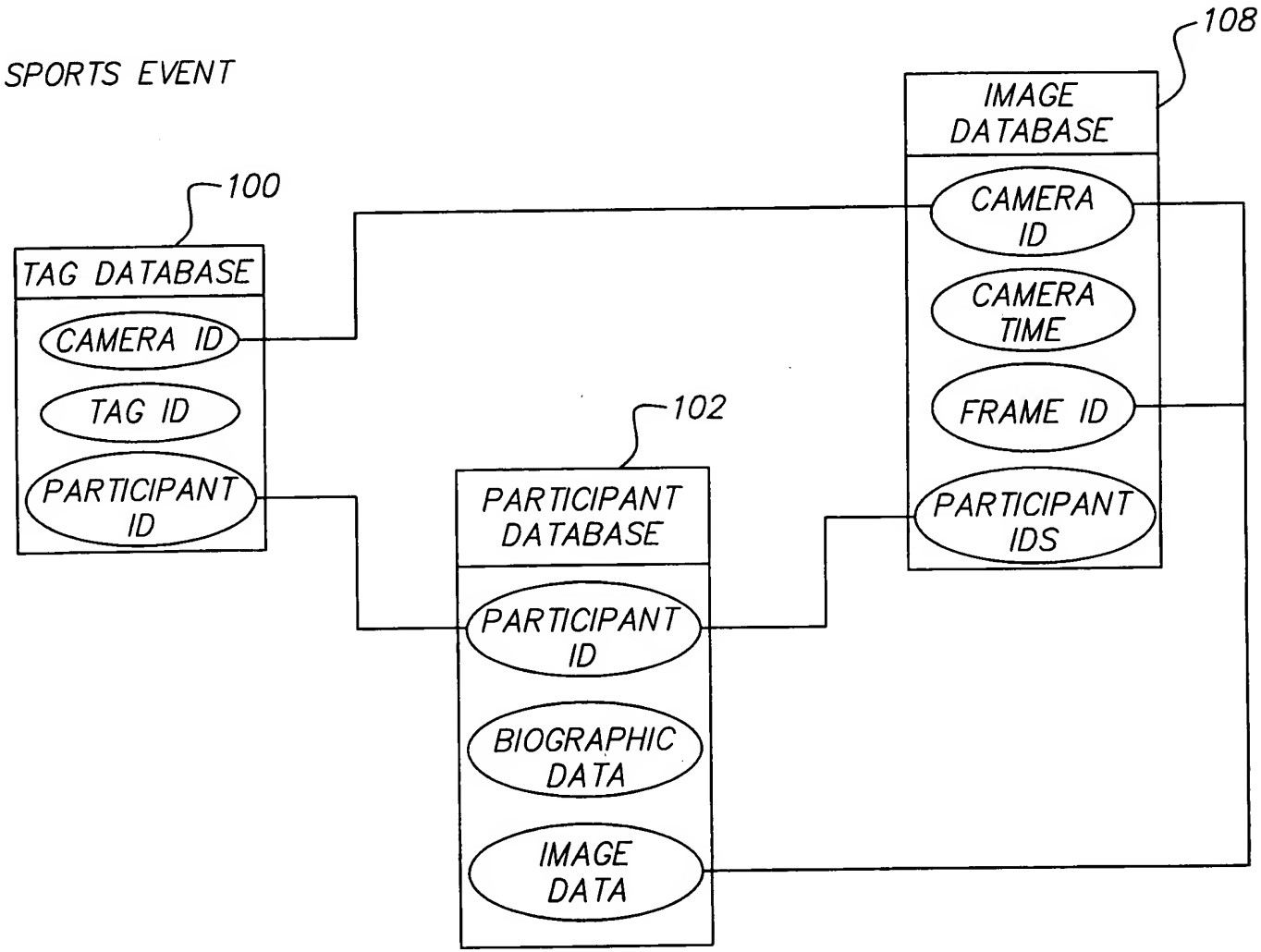

SPORTS EVENT
100
TAG DATABASE
CAMERA ID
TAG ID
PARTICIPANT ID
102
PARTICIPANT DATABASE
PARTICIPANT ID
BIOGRAPHIC DATA
IMAGE DATA
108
IMAGE DATABASE
CAMERA ID
CAMERA TIME
FRAME ID
PARTICIPANT IDS

*FIG. 20*

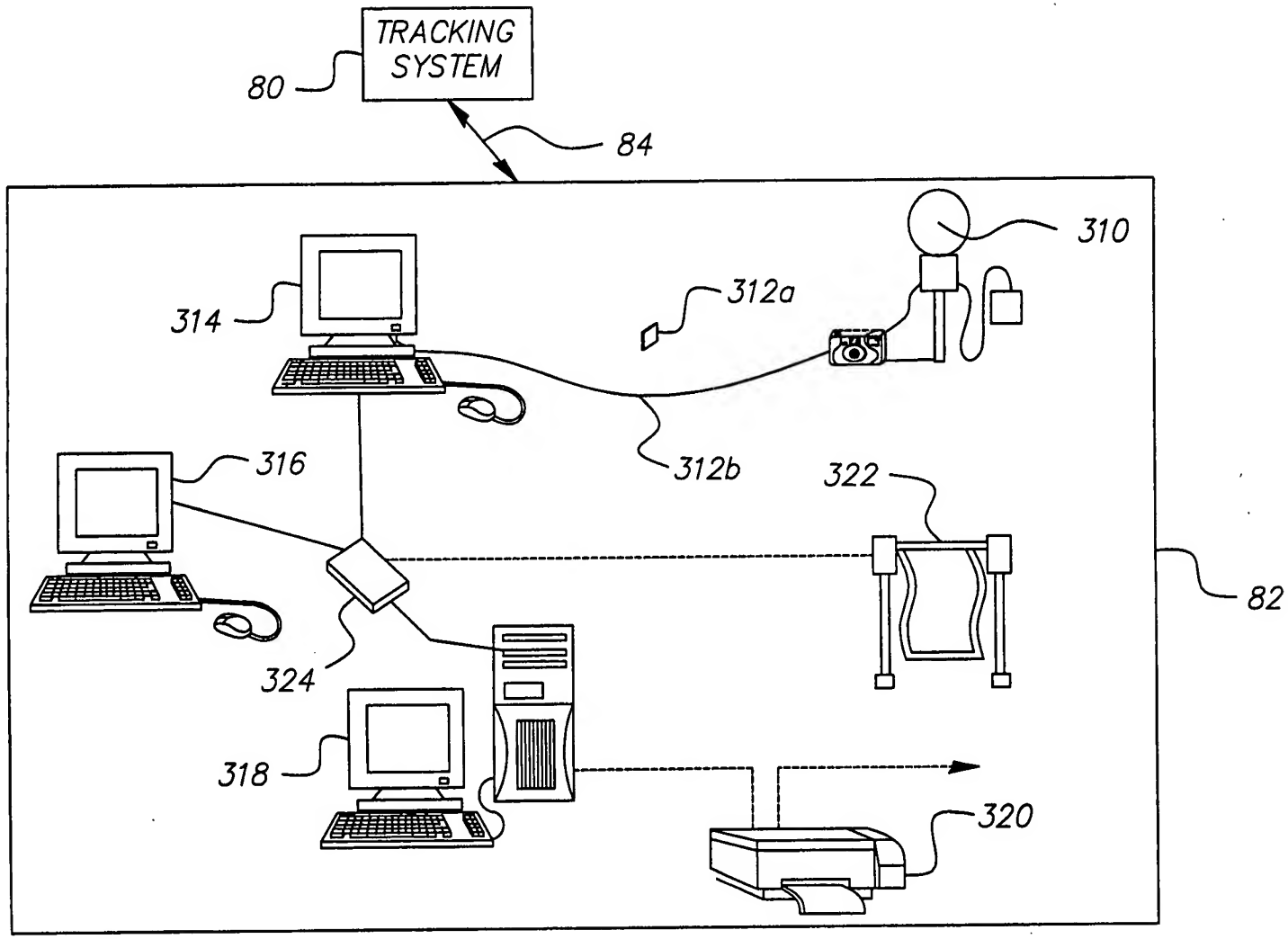



FIG. 21